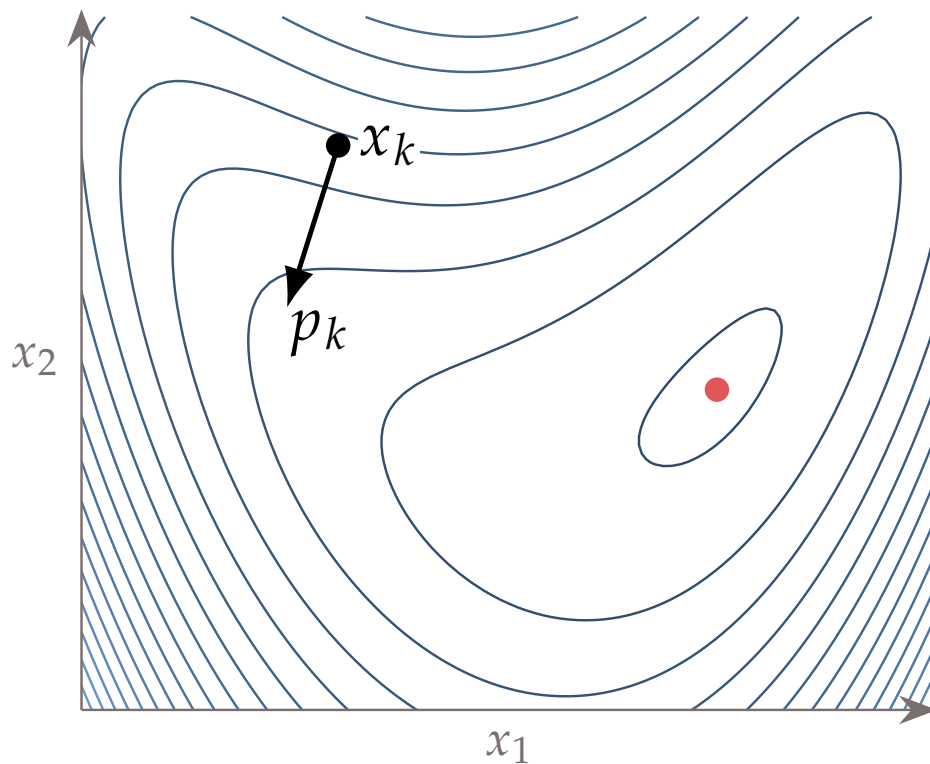


Midterm I

ME EN 275
Andrew Ning
aning@byu.edu



Topics

numerical errors

binary numbers

root finding: bisection, Newton's method, Brent's

integrals with fixed points: rectangle, trapz, Simpsons

integrals of functions: Gaussian quadrature

cumulative integrals

derivative of fixed points: forward, central, backward

derivative of functions: appropriate step sizes

linear solves: matrix form

least squares

plotting

$$y = x^2 \sin x$$

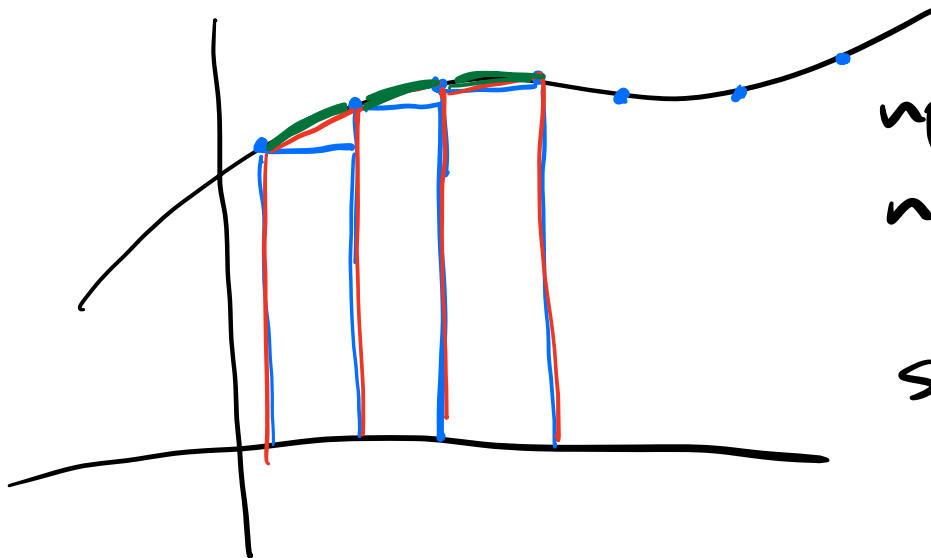
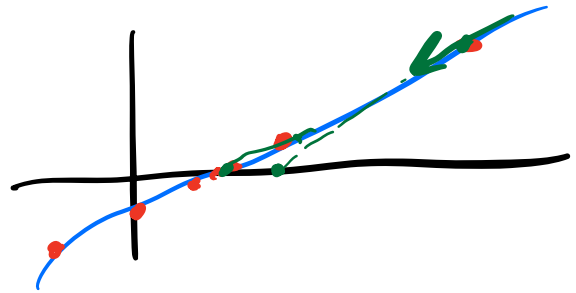


$$y = x^2 \sin(x \cdot y)$$

$$y - x^2 \sin(xy) = 0$$

$$r(y) = 0$$

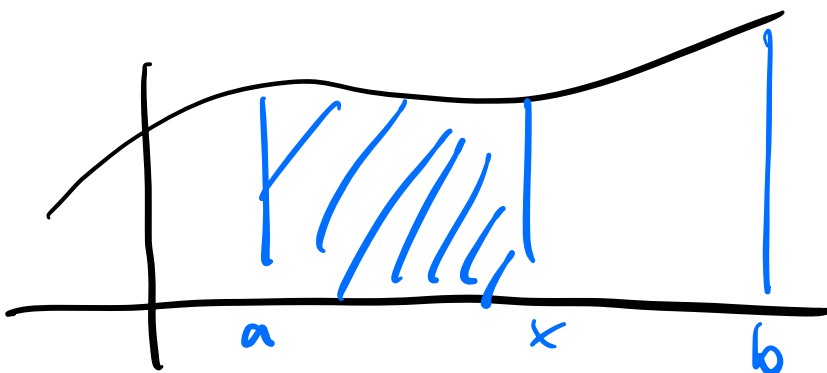
root_scalar

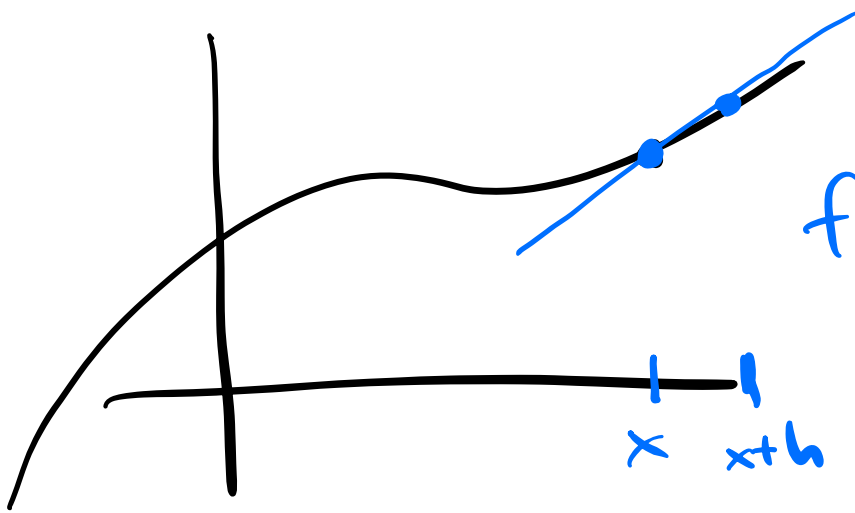


np.trapez
np.trapezoid

scipy.integrate.quad
f(x)

cumulative-trapezoid





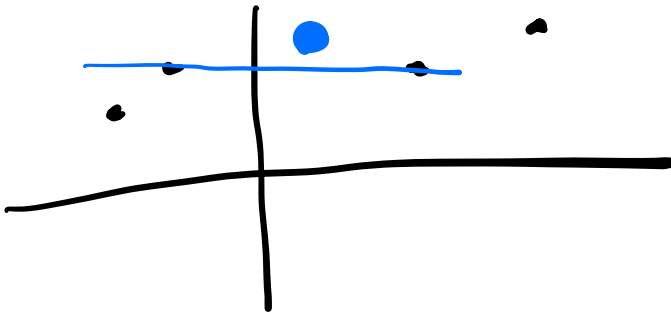
forward

$$f'(x) \approx \frac{f(x+h) - f(x)}{h}$$

backward

$$f'(x) = \frac{f(x) - f(x-h)}{h}$$

mp.gradient



central

$$f'(x) = \frac{f(x+h) - f(x-h)}{2h}$$